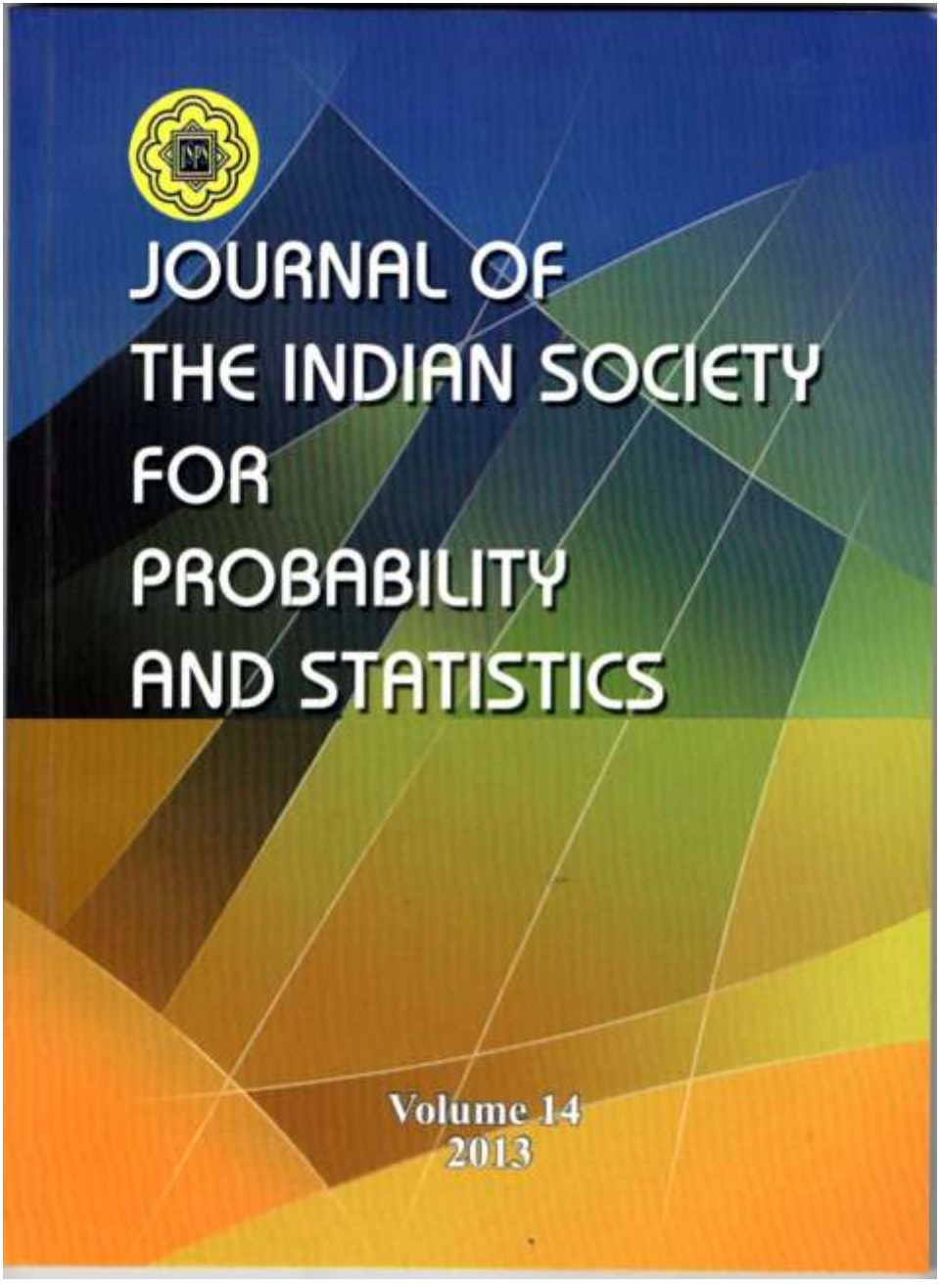
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A Conversation with

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KS. **Sir, I am pleased at this opportunity to talk to you about your distinguished career in Statistics. Tell us something about your school days.**

JS. I am extremely delighted to have this conversation with you about my career, and especially glad to reminisce about my happy school days. My father, Sri Jammalamadaka Rama Murty was the Headmaster of what was aptly named, the "Vivekavardhani Higher Elementary School" which had Grades 1-8, in a village called Munipalle in Guntur District. Either due to my precocity, or more

likely for being a nuisance at home, I was admitted to the first grade before I was 5, by adding an extra year to my age! That was easy to do in those days when there were no birth certificates,and thisstill remains my official date of birth to date. I studied there till the 5th grade, skipping the 3rd grade. Then I took an entrance exam for the 7th grade at a high-school in Appikatla, my father's native town. This was merely a device to get admitted to the 7th grade in the ULCM High School in Guntur (affiliated to the AC College), by skipping again the 6th grade. I finished the 7th and 8th grades there, before moving to the Municipal High School in Bapatla to complete what was at that time the high-school education (the 9-11th grades). Although Bapatla was known for its Agricultural College, there was no Arts and Science College in those days. I finished my Pre University Course at the VRS & YRN College in Chirala, commuting 10 miles each way. Since I was good in mathematics, the obvious career for me was engineering! But it turned out, that all this skipping and jumping of grades didn't help, because I was a full two years below the minimum age requirement for engineering colleges. Working towards the B.Sc. degree at Chirala when that was not my eventual goal, was a luxury my parents could ill-afford especially because of the long and expensive commute (10 miles in those days was a lot "farther" than these days, when elementary school kids do it routinely!!). So I spent one of these two years, learning type-writing and shorthand in which I acquired certificates!

KS. **At graduate and post graduate level you have chosen ISI-Kolkata. Please tell us how you were fascinated towards Statistics profession.**

JS. This is perhaps not quite the answer you were hoping for! It was 1960and the doors to the engineering colleges were not yet open to me because of my age. That was the year when the Indian Statistical Institute (ISI) started offering formal degrees in statistics—the B. Stat. and the M. Stat. My elder brother, who used to work for the LIC in Bombay, noticed the newspaper advertisement for admission tests for the degrees at the ISI, and suggested that I try. I did and was selected. But at age 15, my parents were justifiably hesitant about sending me all the way to Calcutta. I had the spirit of adventure to try new things, and may be part of the drive came from needing to escape from more courses in shorthand and type-writing!!This is a good example of how one's life as well as career, take unexpected and unforeseen turns and twists. Thus, as someone else described himself, I am an "accidental statistician"! I guess most of us are, because in the old days there were only two professions in most of our families—an engineer or a doctor; period!

KS. **You are an inspiring researcher and mentor for several Statisticians. How did you start your research in Statistics?**

JS. When I finished my B.Stat., which was a 4-year professional degree in those days, I was given another pass, and was allowed to skip the first year of M. Stat., and join the second year directly. One should remember that in those days, the M. Stat. was a post-post-graduate degree i.e. one needs to have a masters degree or at the least a strong B.Sc. (Hons) for admission. I chose what was called Advanced Probability and Mathematics as my specialization. I should mention during these 5 years at the ISI, I had a stellar cast of teachers including J.B.S. Haldane, P.C. Mahalanobis, C. R. Rao, D. Basu, V.S. Varadarajan, K.R. Parthasarathy, R. Ranga Rao, and S.R.S. Varadhan, to name some. After I finished the M.Stat., the "Indian Statistical Service" opened up as another career possibility, but after consulting Dr. C.R.Rao (CRR), I decided on doing research and getting a Ph.D. At first we looked at esoteric research topics like generalizing and extending Cramer-Rao bounds to function spaces etc., but then one fine day, a geologist named Supriya Sengupta was sent to me by CRR because he had an unusual kind of data that dealt with directions, and the rest is history!I wrote a short article about my days at the ISI, "Some Randomly Accessed Memories From my Days at the ISI" http://www.pstat.ucsb.edu/faculty/ jammalam /html /ISI reminiscences.pdf, which might interest some of your readers.

KS. **You worked with Prof.C.R.Rao for your doctoral thesis. Tell us your experiences with your research guide.**

JS. Professor C. R. Rao is an inspiring mentor, by his mere stature in the world scene. He was the Director of the Research and Training School at the ISI in those days, and given his research and administrative duties, one does not just walk into office for discussions. In 1967 when the ISI was under scrutiny by the Review Committee about all the seemingly unrelated divisions it had in biology, geology etc., my collaborative research with the geologists was of great help in convincing these committees, the importance of such collaborations. I recall going to CRR's flat inside the ISI campus on a weekend, for discussions with him on developing what have been called tests of homogeneity for mean directions and concentrations of angular data. These tests and the related data analysis of the paleo-current data of this geologist was published in Sankhya in record time—perhaps within 1 or 2 days after we finalized this work! Refereeing? –ah! not necessary if CRR and Mahalanobis agreed it was important!

KS. **You are one of the pioneering persons in circular distributions and directional data analysis. Tell us how you are involved in this area of research.**

JS. As I said before, the query from the geologist as to how to analyze and compare paleo-current data, led me to dig deeper into this subject, which was still in a very nascent stage. Two prominent names working in this area in the mid-60s, and worth mentioning, are R. A. Fisher and G.S. Watson --- perhaps a couple of Watson's students. So I had a pretty clean slate to work with. Later on many others joined in this area of research, like K. V. Mardia (who I can now reveal, was introduced to this area by me, as I was refereeing one of his papers that he sent to Sankhya, and I brought up to his attention the connection to directional data), J.K. Ghosh, Ashis SenGupta, etc. Now there is a good crop of statisticians inside and outside India who have been fascinated by this area.

KS. **How come you moved to USA from India?**

JS. It is not uncommon for some of the better Ph.D. students from the ISI, to spend a few years in a foreign country such as UK, USSR, Yugoslavia etc. But in my case, it was one of the External Examiners of my thesis, who was apparently so impressed with my work that he sent me a hand-written job offer to join him at the Johns Hopkins University, even before he wrote a report on the thesis. This is G. S. Watson, who later commented to me that the 5 chapters in my thesis, would have resulted in 5 Ph.D. theses in the USA! But even before this, I had an offer from the Indiana University in Bloomington, USA, merely because some of my research was presented by my co-author, J. Sethuraman at an International Conference held at that University. I accepted this offer from the Indiana University because in those days, it had an outstanding Mathematics Department. Later on Professor Watson sent me another offer when he moved to the Princeton University, but I was persuaded by the Indiana University to remain there. You heard the quip that a professional may increase the average IQ of the profession in both the places by moving from one place to another!! Hopefully that is not true in my case of moving to the US, and in retrospect, I believe I have been able to do more good to the profession and to Indian statistics by this move.

KS. **Tell us about your experiences in the University of California.**

JS. Indiana University remained essentially a pure mathematics department with no encouragement for applied mathematics or statistics. I then explored the Department of Statistics at the Univ of

Wisconsin, Madison, for a year. Although it was a large department with some big names, I did not see much scope for interaction with the permanent faculty. One winter, the city of Madison almost froze, with no electricity for several days. That is when I was invited to visit the Department of Mathematics at the University of California, Santa Barbara, because they were planning to expand in this area of statistics. The climate at Santa Barbara with its palm trees, the ocean and the beautiful mountains, was an easy sell. The chair of the department, in order to impress me, took me to a grocery store to show me the many varieties of green chilis, which was still hard to get in the mid-west or the east in those days! One of my close friends, Uppuluri Ramamohan Rao who is an alumnus of your department but spent some time at Santa Barbara, used to say that Santa Barbara is like Visakhapatnam's "ammamogudu" in terms of weather and scenery! Having seen both cities myself, I would not put it in such strong terms! I was part of a very collegial Mathematics department there till 1989, when I helped form a separate Department of Statistics and Applied Probability. This department is flourishing with about 18 faculty including visitors, and we cover areas like actuarial statistics, financial mathematics, besides core statistics—both applied and theoretical.

KS. **You have collaborated in developing several areas of statistics like methods for directional data, goodness of fit and estimation based on spacings, large sample theory and efficiencies etc.Tell us about your most satisfying area of research in Statistics.**

JS. I would say they all come together at some level. I started investigating this geologist's problem of circular data, and when one looks for distribution-free methods for such data, the gaps between successive points called the "spacings" come into play because they are a maximal invariant under rotations. This led to asking what tests based on spacings are efficient, and thus the large sample theory and efficiencies. This theme of ideas that started with directional statistics is perhaps the area to which I come back periodically.

KS. **What about teaching? You are a very popular teacher and so many have benefited from your teaching. What is your perception for a good teacher?**

JS. I believe there is no purpose in accumulating knowledge and keeping it to oneself—one has to spread it with a missionary zeal. We in the academic field are blessed with such an opportunity to accumulate and enhance knowledge (research) in the first place, and share it with our students as well as with colleagues around the world through

lectures and conferences (teaching). I believe in this dictum. My students are often amazed when I go into advanced courses and give long lectures and proofs without the help of any notes. I learnt this from my own teachers at the ISI some of whom I mentioned before. If you know fully well what you are talking about, this will automatically come to you as you explain. A good teacher comes through in how one motivates the topic and explains the idea in different ways. An important point about teaching is to bring in contemporary issues and latest research when possible, into the lecture. It is not easy to do that if a teacher brings his or her lecture notes that were developed some 20 years back!

KS. **You have guided several students in Statistics and Probability. What are your experiences with your students?**

JS. I have had nearly 40 Ph.D. students thus far (more in the pipeline), and they are highly placed in academia, industry and government, in many countries worldwide. Unlike some systems, where one is supposed to develop a thesis with minimal guidance, Ph. D. students in the US expect and get considerable help. As one of my colleagues says, it is easier to do your own research and publish papers, than to guide a student and have him/her write papers with you! Given this and the fact that the standards are quite high in the University of California, 40 students is a pretty large number in our field. That they are all doing well is illustrated by 2 anecdotes. One of my students was recruited at Cornell University some time back and 2 years later, the chair of a new recruitment committee there, calls to ask me if I had more students! One other student of mine, made to full professorship in record time at the ISI, Calcutta which has very high standards. I will add another fun-fact that CRR had me look up recently. Of his 51 Ph.D. students, I have produced the most doctoral students(direct students) and then S.R.S. Varadhan.
(see http://www.genealogy.ams.org/id.php?id=27204&fChrono=1)

KS. **You have received innumerable awards and recognitions for your work. Tell us a bit about that.**

JS. I wouldn't say innumerable but certainly a reasonable number. First, recognition from my own profession came in the form of being elected a Member of the International Statistical Institutein 1977(a Membership here is like a Fellowship of various other professional societies), elected Fellowship in the American Statistical Association (1993), Institute of Combinatorics and Applications (1990), and the Institute of Mathematical Statistics (1990). My fellow Telugu-speaking people in USA (Telugu Assoc. of North America) honored

me with an Award for Academic Excellence in 1997. My co-workers and former students celebrated my age with a Festschrift --- a volume of research papers in 2011. Most recently in 2012, I received an Honorary Doctorate from the Swedish University of Agricultural Sciences. These are some of the more major recognitions and awards, about which I am justifiably pleased.

KS. **You helped several professional bodies in Statistics such as IISA & ISPS etc. to grow. Tell us about your association with these two societies.**

JS. I strongly believe in giving back a bit of the knowledge I have, to the country that taught me the skills. I served on a program called "Transfer of Knowledge Through Expatriate Nationals" in 1994. In 1991, on the occasion of the International Statistical Institute Conference in Cairo, some of us got together asking how the NRIs can help the Indian statistical scene, which was pretty dismal at that time, compared to our past glory in the 60s and 70s. This initial group included me, J.K. Ghosh, J. Sethuraman among others, and that was the vision for the formation of the International Indian Statistical Association (IISA). In my personal opinion, the agenda seems to have changed a bit although this is still listed as one of the objectives. I served IISA in many roles including as its President, and received a Distinguished Service Award in 2011. I have been a Life Member of the ISPS for as long as I can remember. As you recall, the two of us organized a very successful joint meeting of these 2 associations in Visakhapatnam in 2010. Also worth mentioning is my role in the formation through fund-raising and other activities, of the Advanced Institute in Mathematics, Statistics and Computer Science in the name of CRR at Hyderabad, and my long-term association with, and assistance to your own department, faculty and students.

KS. **There is also a problem of Statistics in the society. Do you feel that this profession gets adequate recognition in the society?**

JS. That is a very good question. I consider statistics as a key technology of the current day –a technology in the sense we use sciences like mathematics, biology, economics etc. to help scientific progress, and mankind. No amount of experimentation can lead to definitive conclusions and this is where statistical inference helps a scientist make a guarded leap of faith from the observed data to the entirety. As I was pointing out recently, even the physicists who were working on the "god particle" had to make a careful statement about how confident they are, that they found such a particle, in terms of

probabilities. Even if we do not make front page news, we are always in the background --- the invisible hand, and because of this, the common man may not know how important a role we play. That should not discourage us ---just remember that a hero or heroine wouldn't be there on the screen without a director and producer of the film!

KS. **How did your family encourage you during your endeavors?**

JS. My wife Vijaya is very supportive of everything I do, and participates in many of the activities and conferences. She is an environmentalist, specializing in air quality matters, and has been working full-time until about three years ago. She now volunteers with several nonprofit organizations and for many liberal causes. Our two children, Arvind and Arunaare Ph.Ds. in Electrical engineering, and all three of them are knowledgeable in statistics at sufficiently high levels—so much so that I and my son Arvind have a joint research paper.

KS. **What is your advice for young Statisticians and researchers?**

JS. Statistics has always been motivated and inspired by real problems and it is one of the most inter-disciplinary subjects. I would advise young statisticians to learn the language and lingo of another discipline that you want to help with --- be it economics, molecular biology, or finance. Take some related courses even if your degree does not require it. Computing has become an essential part of data analysis these days, so be proficient in that area. Most of the time, it may be enough to learn a package like SAS, R, Matlab etc. but knowing C++ or Java will come in handy if you want to do extensive computations efficiently. Communication is an all-important skill especially since we have to interact with other scientists and perhaps consult on statistical issues. On the other hand, at the level of methodological research, when a student approaches me wanting to do a Ph.D. with me, I tell them that to do serious theory or methodology in statistics one needs to learn a good bit of probability, which in turn needs a lot of mathematics! That is, I think of statistical research as the third layer on a cake where the first layer is mathematics, and the second one consists of probability.

I wish all students and young researchers the very best in their endeavors, and I am extremely pleased to interact with people like you who are there to guide the next generation of researchers in our field.